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Level: HL IB in Biology
Subject: Biology
Topic: IB HL Biology
Type: Topic Question

All International Baccalaureate IB Topic Questions HL Biology

BIOLOGY

HL - IB

Key skills

Question 1

Which of the following statements would be a perceived advantage of ATP?

I. ATP is a stable molecule.

II. Acts as an instant source of energy for the cell.

III. It is a universal energy carrier and can be used in many chemical reactions.

IV. It is a small mobile molecule which can be easily transported to other cells.

A. I, II, III, and IV.

B. I and II.

C. II and III.

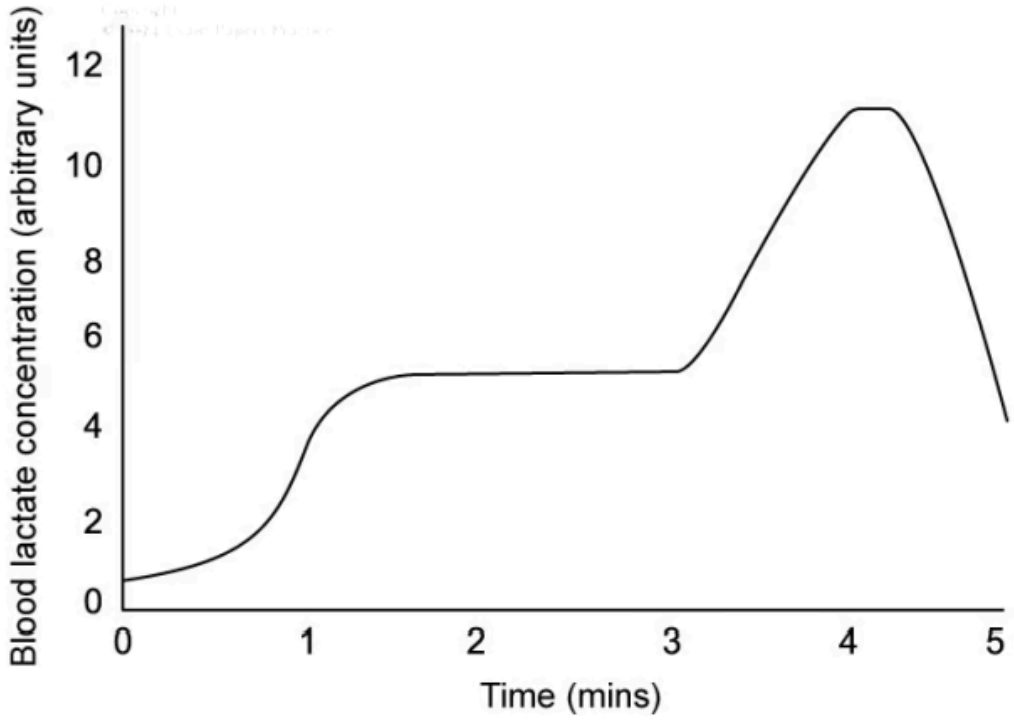
D. II, III, and IV.

[1 mark]

Question 2

An athlete ran 1600m on a treadmill and the speed intensity was varied throughout to simulate race conditions.

The athlete's blood was sampled every 60 seconds and the blood lactate concentration was measured as shown.



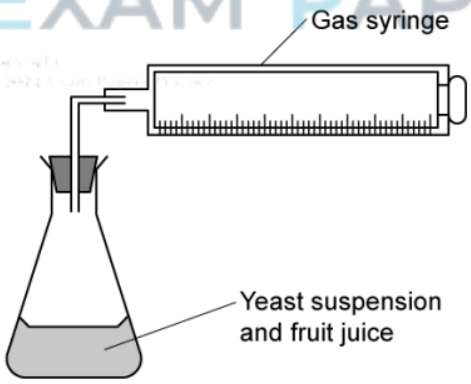
Which statement provides the most likely explanation for the blood lactate concentration between 3 to 5 minutes?

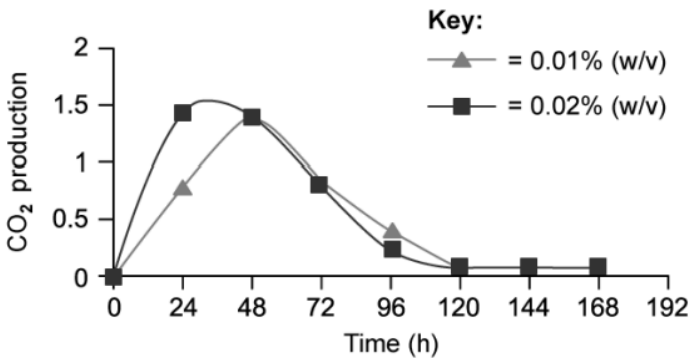
	3 to 4 minutes	4 to 5 minutes
A	The athlete increases their running intensity and their muscles resort to anaerobic respiration	The athlete has slowed down and oxygen is being used to break down the lactate
B	The athlete increases their running intensity and their muscles resort to anaerobic respiration	The athlete has stopped running and carbon dioxide is being used to break down the lactate
C	The athlete continues at the same pace but there is not sufficient oxygen to break down the lactate	The athlete is getting tired and starts to run at a slower intensity so the muscles produce less lactate.
D	The athlete increases their running intensity and the muscles continue to utilise aerobic respiration	The athlete is getting tired and starts to run at a slower intensity so the muscles produce less lactate.

[1 mark]

****Question 3****

The influence of the volume of starter culture on the rate of anaerobic respiration of yeast was investigated using the following experimental apparatus, and the data is also shown.





Which of the following statements could explain the decrease in carbon dioxide production?

I. Oxygen is still present so the yeast respire aerobically.
II. The glucose source is depleted.
III. Accumulation of ethanol is toxic to the yeast.
IV. The starting cultures were different concentrations.

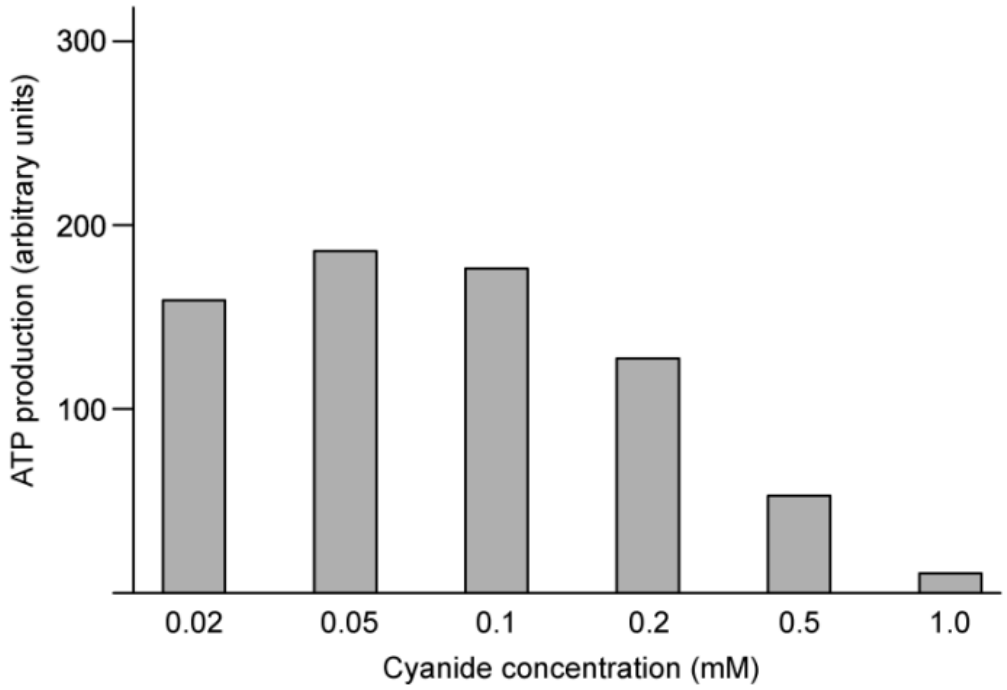
A. I, II, and III.
B. I, II, III, and IV.
C. II, III, and IV.
D. II and III.

[1 mark]

Question 4

An investigation was carried out to study the effect of cyanide on ATP synthesis in a suspension of intact mitochondria.

The graph below shows the results of the investigation.



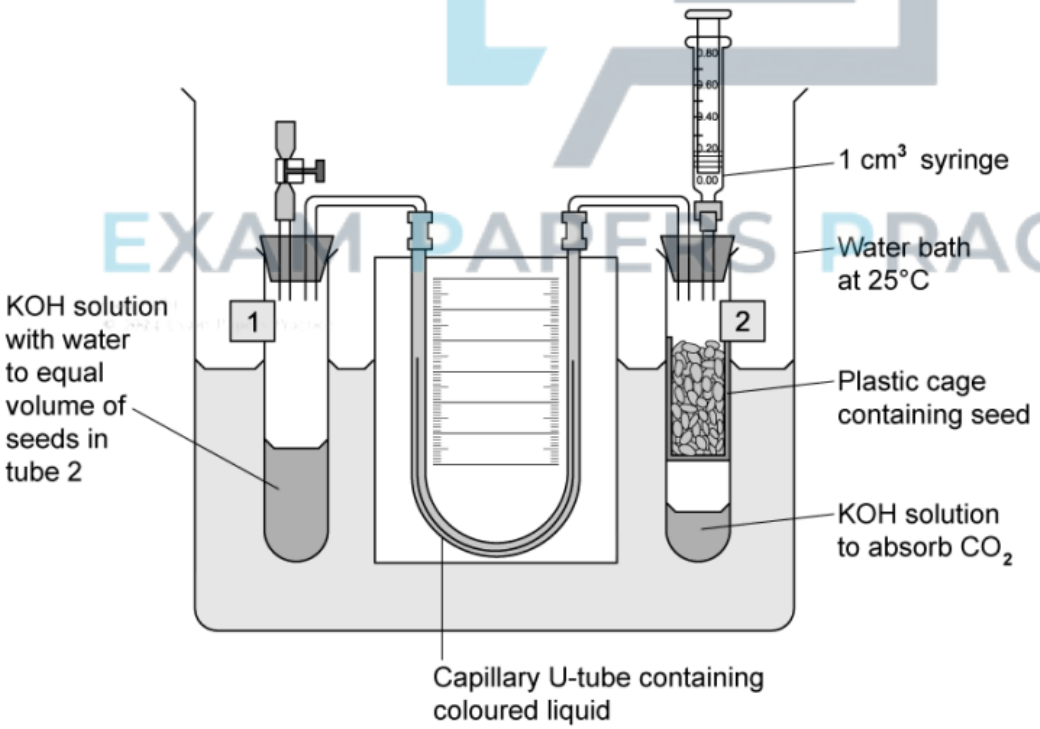
Which statement best explains the trends shown in the data?

A. Cyanide interferes with ATP synthesis through aerobic respiration.
B. Cyanide interferes with ATP synthesis through both aerobic and anaerobic respiration.
C. Cyanide splits ATP molecules to yield ADP and phosphate.
D. At high concentrations of cyanide, only anaerobic respiration occurs.

[1 mark]

****Question 5****

A respirometer was used to investigate the rate of oxygen consumption in aerobic respiration by germinating seeds. The apparatus used in the investigation are shown.



Which of the following statements about the use of respirometers are correct?

I. There are ethical concerns with using any live organism.

II. The water bath is maintained at 25°C because slight variations in temperature can affect air pressure.

III. The temperature of the water bath can be altered to investigate how temperature affects the rate of respiration.

IV. As CO_2 is absorbed by the KOH, the air pressure is reduced inside the sealed chamber (labelled 2).

A. I, II, and IV.

B. II, III, and IV.

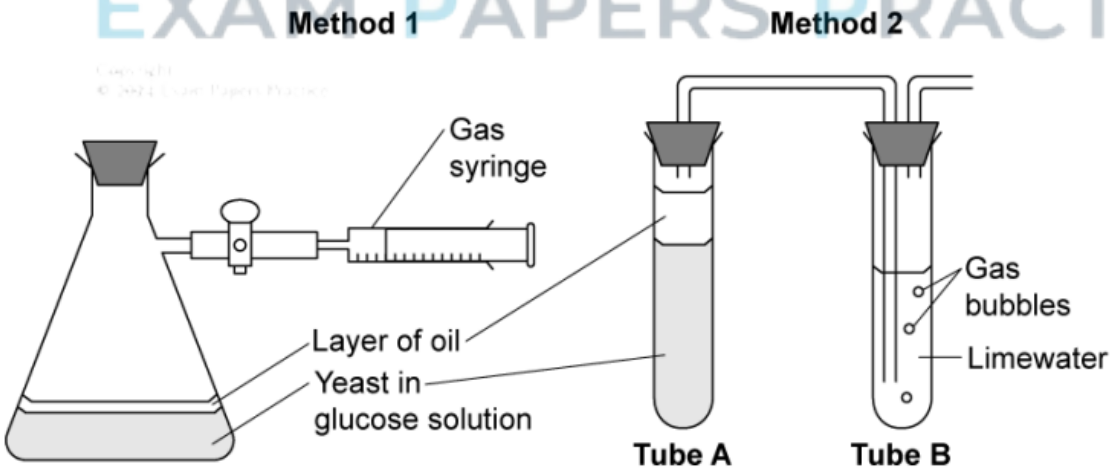
C. I, III, and IV.

D. I, II, III, and IV.

[1 mark]

****Question 6****

Some students were investigating the production of carbon dioxide from anaerobic respiration in yeast at different temperatures. They had access to the apparatus to carry out two different methods.



Method 1: Using a gas syringe, students collected gas produced by yeast at different temperatures.

Method 2: Using limewater and a delivery tube, students counted the number of bubbles of gas produced by the yeast at different temperatures and used limewater to show that it was carbon dioxide.

Which method should the students use and why?

A. Method 1 should be used because a statistical analysis can be carried out on method 1 but not method 2.

B. Method 2 proves that the gas produced is carbon dioxide; this gives more valid results.

C. Method 1 should be used because it provides quantitative measurements, which will be more accurate.

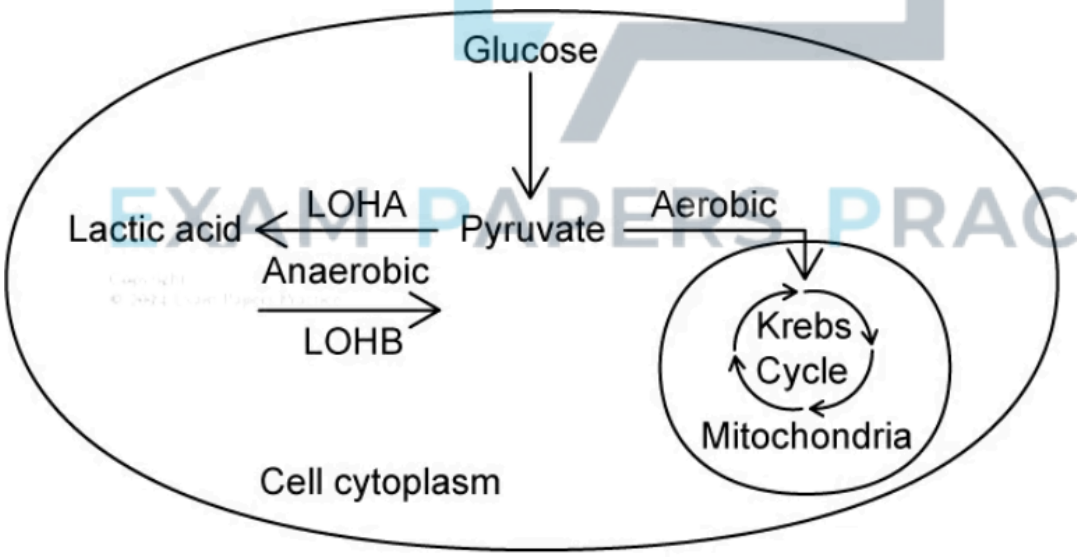
D. Method 2 should be used because it gives qualitative and quantitative results so is more accurate.

[1 mark]

****Question 7****

In an investigation into the impact of enzyme inhibition on respiration, scientists used a molecule to inhibit transcription of the gene that codes for the enzyme LDHA.

Using the diagram, identify the likely effect this would have on the process of respiration.



I. Increased production of lactic acid

II. A build-up of pyruvate in anaerobic conditions

III. Increased activity of the Krebs cycle in aerobic conditions

A. I, II, and III

B. I only

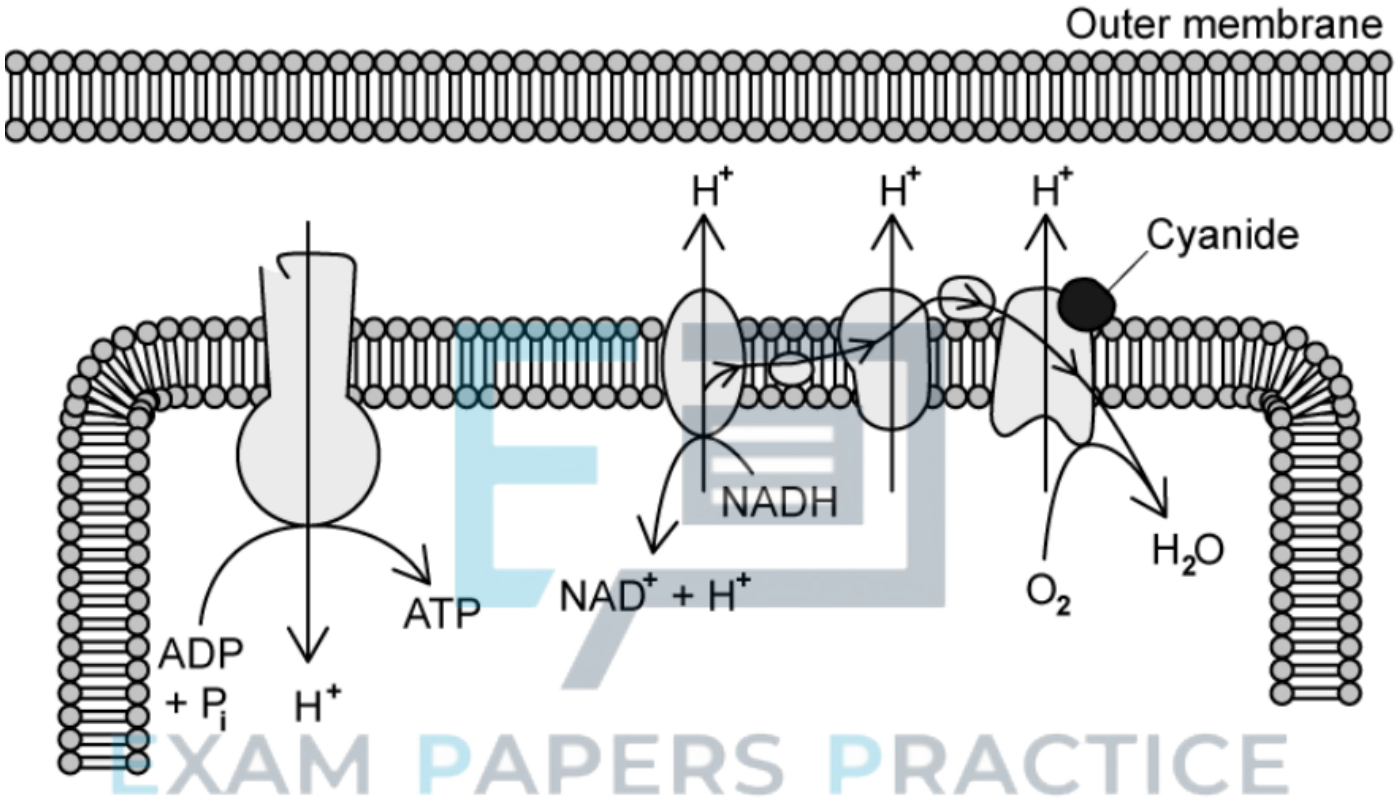
C. II and III

D. II only

[1 mark]

Question 8

The diagram shows the electron transport chain in the membrane of the mitochondria.



Cyanide is a poison that causes cell death through inhibition of the final electron transport protein when it binds as shown in the diagram.

Which statements correctly describe the impact of cyanide binding to the final transport protein?

I. A decrease in pH of the intermembrane space

II. A decrease in production of H_2O

III. An increase in electrochemical gradient

IV. Inhibition of ATP synthesis

A. I, II, and IV only

B. II and IV only

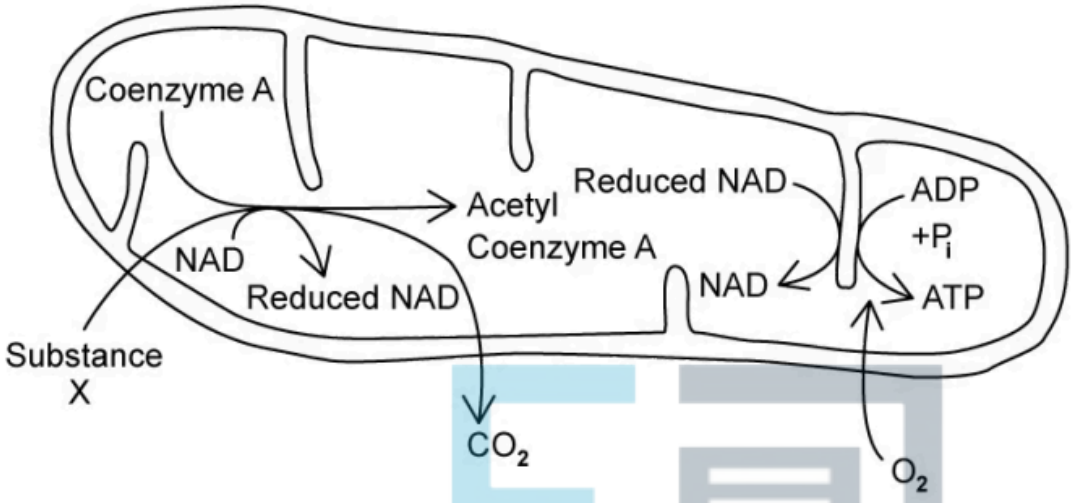
C. I and II only

D. II, III, and IV

[1 mark]

Question 9

From each molecule of substance X (in the diagram), how many molecules of ATP can be produced?



A. 17

B. 34

C. 36

D. 18

[1 mark]

Question 10

Which of the following statements about the Krebs cycle are correct?

I. NAD^+ is oxidised and returned to the link reaction

II. Citrate is decarboxylated to form a 6 carbon molecule

III. $FADH_2$ is produced and sent to the electron transport chain

IV. Oxidation of acetyl groups is coupled to reduction of hydrogen carriers.

A. II, III, and IV

B. I, II, and III

C. II and III only

D. III and IV only

[1 mark]

Question 11

The following steps describe processes involved in oxidative phosphorylation.

1. Redox reactions drive the movement of protons across the cristae to the intermembrane space
2. Oxygen molecules combine with protons and electrons to form water
3. NADH and $FADH_2$ donate electrons to the first transport protein in the chain
4. Hydrogen ions (protons) are also released as the coenzymes are oxidised
5. A high concentration of protons in the intermembrane space creates an electrochemical gradient
6. Electrons move down the proteins in a series of redox reactions
7. Protons move down the electrochemical gradient through enzyme ATP synthase

Which of the following shows the correct sequence for these steps?

A. 1 → 4 → 6 → 2 → 5 → 7 → 3
B. 3 → 4 → 6 → 1 → 5 → 7 → 2
C. 3 → 6 → 1 → 5 → 7 → 2 → 4
D. 6 → 3 → 5 → 7 → 2 → 4 → 1

[1 mark]